

ever, Larsen discusses several major theoretical issues in paleodemography in his concluding chapter and refers the interested reader to numerous demographically focused studies, probably the best choice in view of the topic's complexity. The volume has been carefully produced and is well illustrated with numerous black-and-white photographs and graphics. Larsen's decades of scholarly experience have given him a firm command of the worldwide bioarchaeological literature: the 88 page bibliography contains some 1,700 references spanning more than a century, all of them representing serious (if not always successful) inquiries into past human biocultural adaptation. My only reservation about the volume is its price: not outrageous or unjustified to be sure, but unfortunately almost out of the range of student pocketbooks; this will probably limit its use in undergraduate courses.

However, it is an absolutely *required* acquisition for any scholar, library, or laboratory with a serious interest in anthropological reconstructions of human life in the past. Happily, the days of dry-as-dust skeletal appendices limited to long tables of uninterpreted measurements and photographs of interesting skulls, reluctantly included as afterthoughts to the real material of archaeology (pots and points), are clearly over, and long may they resquaint in pace!

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TOOTH ENAMEL MICROSTRUCTURE. Edited by Wighart von Koenigswald and P. Martin Sander. Rotterdam: A.A. Balkema. 1997. 280 pp. ISBN 90-5410-667-0. \$95.00 (cloth).

Enamel is the hardest and stiffest material in our bodies. As a result, it is also the most commonly preserved material in our fossil record. Spawned by these facts, recent advances in the study of genetics, embryology, development, microscopy, and biomechanics have left enamel in a position of great importance in the study of primate paleobiology. Not surprisingly, then, there have been a number of recent books focusing on the study of teeth. However, these have been either general summaries of information (e.g., Hillson, 1996, Scott and Turner, 1997) or edited volumes with other foci (e.g., Lukacs, 1998). Until now, nothing has summarized state-of-the-art research on enamel. This volume is an initial attempt to do so. It is the result of a workshop held in Andernach/Rhine, Germany, on July 24-28, 1994. Twenty-five researchers participated in the workshop, and 16 eventually contributed to

the 15 chapters in this book. The chapters were broadly conceived to cover the major fields of current enamel research, and they are organized around Koenigswald and Clemens's (1992) well-known hierarchy of enamel microstructure, moving from chapters on the crystallite and prism levels on through chapters on enamel types and on the schmelzmuster and dentition levels (i.e., the spatial distribution of enamel types within the crown of a tooth or within different teeth, respectively). As is so often the case with this publisher, the illustrations, particularly the scanning electron microscopy micrographs, are exquisitely done. Thus, the relatively high cost of the volume might well be justified by that fact alone. Another major strength of the volume, however, lies in the general nature of the topics covered by some of the authors. Admittedly, there are no chapters focusing specifically on primates, and, as with many edited volumes, some of the contributions have a very narrow focus, but there are also some *excellent* reviews of important topics in enamel research. This is all followed by the editors' glossary of terms at the end of the

volume, which is a must for most dental researchers.

The book begins with a very useful review of the ontogeny of mammalian enamel by Moss-Salentijn et al. Given the amount of exciting research being done on such topics as the genetic control of enamel development and the use of microstructural markers to monitor dental development in fossils, some readers will probably feel that their favorite topics have been slighted. However, the point remains that this is an excellent starting point for readers interested in this rapidly growing topic.

There is only one chapter focusing on the crystallite structure of enamel, a review of chemical properties and crystallography by Sakae et al. Much of it stems from the first author's work on elephant enamel, and it would have been nice to see information on other properties of enamel (for example, physical properties such as elasticity and strength). But the chemical and crystallographic insights are extremely useful for the consideration of topics like diagenesis.

At the prism level, the emphasis is on the evolutionary origins of enamel prisms. Sander presents an exciting summary of his new ideas on the origin of mammalian enamel prisms. This is followed by a look at the earliest enamel prisms by Wood and Stern. Both papers emphasize the need for more developmental studies of the enamel of modern mammals and reptiles, and both papers also raise phylogenetic questions that are put in interesting perspective by the subsequent chapter by Clemens on the use of enamel prismatic structure in systematic analyses. Basically, the take-home message there is that the complexity of enamel microstructure makes it potentially useful in such analyses but that developmental and constructional constraints also make parallelisms likely; thus, phylogenetic analyses will be difficult. The last chapter in this section, by Gilkeson, carries a narrower focus on a specialized topic (enamel tubules in Australian marsupials) and will be of interest to a more limited range of readers.

The section on enamel types includes only Stefen's chapter on the Hunter-Schaefer bands of carnivores, although Rensberger's

later chapter on biomechanics also delves into some similar topics. Stefen's chapter, which is the first published summary of valuable thesis work, will be of broader interest than its title might suggest due to widespread interest in the function of Hunter-Schaefer bands in other mammals, including primates.

Coverage of research at the schmelzmuster level is broader than in the previous section, in large part due to Koenigswald's survey of schmelzmuster diversity in Cenozoic placental mammals. However, the other two chapters in this section (by Martin on incisor enamel in rodents and by Sahni and Koenigswald on the enamel structure of fossil and recent whales) also provide interesting biomechanical and phylogenetic insights.

For the dentition level, again there is only one chapter, a survey by Koenigswald of enamel variability in mammals. It could have benefited from a comparative series of micrographs, but it still provides useful thumbnail sketches of enamel variability at the dentition level.

With the survey of various steps in the hierarchy of enamel structure finished, the book moves on to four chapters that cut across such hierarchical distinctions. Koenigswald's chapter on evolutionary trends in the differentiation of mammalian enamel is an excellent review of enamel variation at each level in the hierarchy. Given the range of topics he has examined over the past 20 years, Koenigswald is probably the only person who could have written and illustrated such a chapter. It is followed by two chapters focusing on the biomechanics of enamel, a broad one by Rensberger on mechanical adaptation in enamel and a more specific one by Koenigswald and Sander on schmelzmuster differentiation in leading and trailing edges of rodent teeth. To me, these chapters are the highlights of the book, as they put to use what we are coming to know about enamel microstructure. They not only give a fascinating picture of how teeth are used, but they lay the groundwork for even more paleobiological interpretations in the future. The final chapter is the aforementioned glossary of terms, which will undoubtedly help researchers stay on the same page in communicating with each other!

The aim of this workshop was to discuss "the entire range of aspects related to ontogeny, biomechanics, and phylogeny of tooth enamel" (p. 2). Certainly that is too much to distill into one book. However, the editors are to be given many thanks for their efforts to give us the first step towards that goal.

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